Farmer-financed irrigation: the economics of reform

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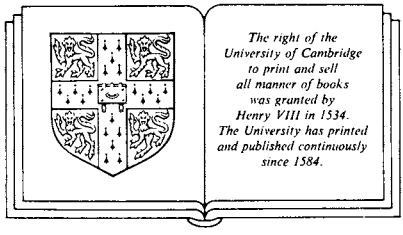

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Contents

1

Irrigation financing in perspective

1.1 *Irrigation in the context of Third World development*

1.1.1 *Irrigation and world food supplies*

Irrigation provides supplementary water supply to one-fifth of the world's cultivated land, from which one-third of the world's food is harvested. Many of the world's poorest people are dependent on this food. Billions of low-income people struggle to supplement inadequate and unreliable rainfall with irrigation.

The stakes are clearly high. Two statistics highlight this. One in five of all people in the world is a Chinese peasant and most of them are irrigation farmers. Every month there are a million more Indian farmers and most are or would like to become irrigation farmers.

Irrigation is a potentially effective investment to service the basic needs for food and employment in the developing world. But the investment necessary to develop new irrigation systems is costly. And the expense does not end with the construction of irrigation facilities. The provision of reliable irrigation service requires recurrent expenditures for operation and maintenance.

Irrigation has been an extremely important development investment area in recent years and it is going to be even more important in the future. In several large developing countries like China, India, Indonesia and Pakistan, half of all agricultural investment goes into irrigation. Some 25–30% of World Bank agricultural lending is allocated to irrigation. In the next 10 years between $50 and $120 billion will be spent on new irrigation and on rehabilitating existing projects.

These investments reflect a dramatic increase in the potential returns to irrigation brought about by important technological changes in agricul-

tural production. These changes (collectively known as the 'green revolution') were centred upon the widespread adoption of new stiff-strawed varieties of wheat and rice that responded to high doses of artificial nitrogenous fertiliser. The high potential yield of this seed-fertiliser technology was only obtainable with crop protection, including an adequate, reliable supply of soil moisture. This technology spread first to areas with good irrigation, and provided an impetus for further irrigation development. As a result, nearly three-quarters of recent increases in agricultural production have come from irrigated land.

The green revolution was thus centred on a package of modern scientific inputs that has pushed grain production further from the traditional subsistence methods into the cash economy. On the horizon in the near future is a new set of seeds and plants that will be the product of biotechnology. We can be fairly confident that although new technology will increase potential returns, the total variable costs will also rise over time. All food crops will in time become cash crops to a greater or lesser degree.

Irrigation will continue to be important in providing the secure growing conditions that will make high input, high output farming economically feasible. Any failure of irrigation to function in line with its potential implies extremely high opportunity costs in economic and human terms, as the scope for rural poverty alleviation would be very much reduced.

1.1.2 *Irrigation problems*

Unfortunately the consensus among irrigation researchers and financing agencies is that irrigation is not performing anywhere near its potential. As one reviewer concluded in a damning summary of field evidence:

> Evaluations of public irrigation systems have shown that, in most, service has deteriorated due to faulty design and construction, neglected maintenance, and inefficient operation. Distribution channels, if aligned properly to begin with, become silted up or breached as time goes by. Even in systems designed for regular rotational water distribution, deliveries to most farmers are erratic and unreliable.[1]

There is considerable evidence that the potential gains from irrigation are far from being fully realised. For example, inadequate water management is held to be the largest single factor in explaining the gap between actual and potential rice yields. It is estimated that more than half the water supply lost before reaching the crops could, with sound infra-

structure and good management, be beneficially used, increasing water availability for crop growth by up to 25%.

Numerous interrelated reasons account for the failure of irrigation investments to produce their intended benefits. No single reason, not even financial problems, can be put forward to explain failure of irrigation investments to realise their maximum potential. Problems cited in various analyses include:

(i) inadequate preparation of projects (e.g. poor assessment of water availability, soil analysis, etc.) and faulty design (especially at the farm end of systems);
(ii) substandard, careless construction;
(iii) underinvestment in infrastructure (e.g. lack of drainage, insufficient control structures);
(iv) poor canal management and organisation (e.g. faulty personnel policies);
(v) insufficient financial resources and priority for operation and maintenance;
(vi) poor crop production techniques and agricultural services (e.g. use of low quality seeds, no or inadequate extension services);
(vii) neglect of public health aspects of irrigation design and operation;
(viii) poor land levelling and water management at the farm level;
(ix) exogenous problems such as unrealistically low prices resulting from crop pricing policy and unreliable delivery of inputs such as fertiliser or electricity;
(x) poor coordination between engineers and agricultural specialists (Box 1.1).

These problems are interlinked. One problem can initiate another which can cause a third and so forth. Poor canal design can lead to shortage of water. In turn, this leads to farmers adopting unorthodox coping mechanisms or even stealing extra supplies which, in arid areas, will cause waterlogging at the head of canals and drought and soil salinity in the irrigated lands at the tails. Low returns to farmers in these circumstances may, in time, lead to farmer refusal to pay irrigation charges or service fees. Financial delinquency by a few farmers may rapidly lead to widespread non-payment and starve the operating agency of financial resources which may in turn affect operation and maintenance.

The focus of this book is on the financial problems of irrigation. But as the above paragraph demonstrates, irrigation is part of an interdependent socioeconomic system, and therefore reform of the financing com-

BOX 1.1

Phases of interdisciplinary cooperation in the history of developing-country irrigation

Four phases of interdisciplinary cooperation can be identified according to the specialties involved:

Phase I Military engineers, civil engineers, administrative officers, and financial analysts

Phase II Civil engineers, administrators, financial analysts and *agriculturalists*

Phase III Civil engineers, financial analysts, agriculturalists and *economists*

Phase IV Civil engineers, financial analysts, agriculturalists, economists and *farmers* (plus specialists in other areas such as public health, the environment, and sociology).

Phase I lasted the longest and Phase II did not really dawn until the second half of the twentieth century. Phase III is a post 1950s phenomenon and Phase IV is yet to appear. The neglect of agriculture and agriculturalists is longstanding. Consider the following citation from the *Indian Agriculturalist* of July 1876.

> **There is great truth in his (Corbett's) assertion that an irrigation cry and a drainage cry, have induced the Government to embark in projects purely engineering and not agricultural, to trust the agricultural education of India solely to engineers and to district officers; the former of whom look upon agricultural projects from a purely engineering point of view, while the latter have little interest in agricultural matters beyond the narrow one of collecting the revenue. In a country which is so largely dependent as India not only for the subsistence of its vast population but for its political maintenance, upon the productiveness of the earth, the science of agriculture should doubtless be made of the first importance and should have been called in to aid all projects of agricultural improvement.**[2]

ponent requires a holistic approach that recognises the complexity of interrelationships among all the components of the system.

1.1.3 *Macroeconomic setting*

The severity of the present economic and financial crisis facing most developing countries and the prolonged international recession of

the 1980s are generating unprecedented difficulties for governments in general, and, in our context, for irrigation authorities in particular. The current macroeconomic context has inevitably created new problems and priorities for the irrigation sector. Typically, national debt service obligations are causing extreme obstacles: many public sector institutions have liquidity crises and some agencies are practically insolvent. A precondition for any effective irrigation sector policy analysis for the 1990s is a consideration and proper understanding of the macroeconomic framework. This is particularly true of any analysis of financial elements of irrigation policy. Unless and until the ramifications of the macroeconomy are recognised, there can be no guarantee that any change in irrigation policy will be an effective, let alone an efficient, improvement. In an unstable economy, a policy change that would be helpful in other circumstances could even cause damage.

Despite substantial economic progress in developing countries during the 1970s, the varied external and internal economic shocks of the 1980s have revealed crucial structural weaknesses in these economies. It is now apparent that growth in the 1970s was being obtained at high investment cost. In many areas such as manufacturing (and in some sections of agriculture), high levels of protection and public sector subsidy using inappropriate trade, industrial, financial and exchange rate policies led to sheltered investments in activities where many developing countries lacked a clear comparative advantage.

In the agricultural sector, government market regulation and input and output price controls, together with archaic institutional frameworks, limited the capacity of the sector to benefit fully from the general economic growth of the 1970s. There is now belated but widespread recognition of the negative impacts that taxing agriculture to fund urban sector needs can have on a nation's economic growth; however, the temptation will remain in some countries to continue such policies because of the scale of agriculture, the severity of the adjustment problem, and the few alternative policy instruments available to governments.

If agriculture did well in some developing countries in the 1970s (such as where irrigated wheat and, latterly, rice were the main crops) it often did so in spite of, rather than because of, public sector policy. It seems likely that agricultural planners in the 1990s will have to rely upon agricultural growth yet again to stimulate their economies but without moving the internal terms of trade too much in favour of agriculture.

By the mid-1980s many irrigation agencies and projects were facing

unrelenting financial problems. We need to explore how this could have arisen when irrigation at least appeared to be a relatively successful technology during the 1970s. It is certain that the unfavourable macroeconomic situation played a key part.

The macroeconomic picture that emerged in the early 1980s was confused. However, recognition of government use of massive external borrowing and imports to bolster the gains of the 1970s and to sustain investment programmes in the face of unfavourable world economic conditions, sharpens the image. It is clear that despite public sector initiatives, economic growth failed to resume previous levels; high interest rates and global inflation prevailed; and for many countries there was a stagnation in terms of trade. The growth of external deficits was exacerbated in most developing countries by a fall in government revenues.

Many governments underestimated the severity and duration of recession and borrowed heavily for both investment and consumption purposes. The perception that structural adjustment to a new economic order was a necessity was only slowly realised in 1979–83. Furthermore, achieving stabilisation and adjustment, once the problem was recognised, has proved to be a harsh and costly process. In addition to unfavourable external factors, there are often domestic political imperatives such as the need to reduce the impact of urban unemployment and to protect infant industries not yet able to 'grow up' to competitive independence. Responding to these features will inevitably restrict or slow the adjustment process.

In this process, irrigation institutions have probably suffered less than manufacturing industry; however, the expansion of the area irrigated has generally slowed, and the farmers dependent upon technology such as pumped schemes and groundwater have often faced rapidly increased costs (or have added to the government's financial burden). The expenditure patterns of many governments between 1979 and 1985 have produced a medium-term shortage of financial resources. There are clear limits to the ability and willingness of many governments to finance irrigation infrastructure from general revenue. In our field studies we were repeatedly informed by government officials that financial stringency in public expenditure threatens to reduce further the generally unsatisfactory standards of irrigation performance.

Thus, the irrigation sector illustrates the general public sector recurrent cost problem: expansion of the investment portfolio resulting in large increases in the demand for recurrent expenditures to operate and

maintain the infrastructure; and an inability to finance these expenditures adequately. The scope for continuation of many of the direct and indirect financial subsidies of the past is extremely limited. But to allow irrigation facilities to deteriorate at a time when complementary inputs have combined to create unprecedented productivity for irrigation would be irrational. Hence, most governments in developing countries are being forced to reconsider their policies toward farmer payments for and participation in irrigation operation and maintenance. Financing irrigation with funds provided by farmers through one means or another becomes nearly inevitable.

But while macroeconomic conditions have created fiscal stringencies that make governments look to increased funding of irrigation costs by the farmers, other broad economic forces may make this approach difficult. For example, the success of national and international efforts to increase agricultural production may have been great enough to depress crop prices.

This is well illustrated in the case of Indonesia. Between 1976 and 1983, Indonesia's rice and wheat imports averaged 2.6 million tonnes and cost about $500 million annually. The government has given high priority to intensive efforts to increase agricultural production. These efforts have included promotion of modern rice varieties with high levels of fertiliser application, and massive investments in rehabilitating and extending irrigation. Since 1968 the World Bank alone has provided more than one billion dollars for irrigation expansion and improvement. These policies have combined to produce a rice surplus at the favourable price environment presently enjoyed by farmers. However, the government is struggling to maintain high real producer prices because prospects for exports are very limited, the financial cost of crop purchase for government storage is extremely high, and the physical limits to suitable grain stores are nearly reached. If such circumstances combine to reduce farm prices and farm incomes, the scope for simultaneous significant increases in fees or charges for irrigation are much reduced. This illustrates the broad and complex context within which irrigation financing and water pricing policies have to be considered.

1.2 *The approach of the book*

1.2.1 *Focus on financial policies for irrigation*

Our work on irrigation problems in Third World countries over the past several years has convinced us of the importance of irrigation

financing policies. Severe financial difficulties in the irrigation sector are common, often leading to declining irrigation performance.

These financial difficulties are related to the fact that public irrigation is often heavily subsidised. While such subsidies are commonly found in industrialised nations as well as in Third World countries, the financial difficulties are often greater in the latter nations because of greater overall budgetary constraints. As irrigation development in the Third World has proceeded over the past several decades, levels of subsidies that were acceptable when the total amount of irrigation was small have become increasingly burdensome to government budgets.

From a straightforward accounting view, the financial subsidies given to irrigation users are easy to identify. For Third World countries these subsidies almost always include not only the investment cost of the irrigation facilities, but also part or even all of the expenditure needed to pay operation and maintenance costs.

The existence of a financial subsidy, however, does not necessarily mean that a true economic subsidy is being given to the irrigation farmers, because of the myriad of indirect charges and implicit taxes that are levied on them. Governments in developing countries often squeeze irrigation (and other) farmers by manipulation of agricultural markets, export duties, and the maintenance of overvalued exchange rates. These typically add up to a massive financial burden to agricultural producers and exporters and subsidies to the mainly industrial importers. Furthermore, the squeezing of resources from agriculture by indirect means, negatively affecting the relative prices between the agricultural and industrial sectors (what economists call the domestic terms of trade between agriculture and industry), can have extremely harmful disincentive effects.

Public policy affects the availability and price of virtually all inputs and outputs in the irrigation sector. In evaluating a proposed policy change, such as, for instance, an increase in water fees to signal the real costs of providing irrigation service to farmers, the overall context has to be simultaneously considered; otherwise, infeasible or inappropriate policies may be advocated. This is perhaps best illustrated by a hypothetical but fairly typical example. If rice is the major crop in an irrigation system and the price is held at two-thirds of the free market or equilibrium price, then there is a transfer of income from producers (rural) to consumers (mainly urban). The rural areas will in effect be subsidising urban wage earners and urban industrialists, but it is difficult to determine by how much. To impose high irrigation charges in such circumstances in order to

generate public savings, or even to cover the costs of installation or just operation and maintenance, may be impractical as well as unjust. However, if agriculturalists at the same time are subject to a set of subsidies and taxes for credit, fertiliser and other inputs, export taxes, export quotas and so forth, the policy environment becomes exponentially more complex. Irrigation authorities in many countries operate within just such a policy framework involving complex economic distortions.

Mobilising financial resources for irrigation is thus but one aspect of irrigation policy. Farmers are simply one possible source of finance. Finance is not the only resource farmers can offer: their labour may be of greater value. However, making judgements about the appropriate level and mechanisms for farmer contributions involves complex economic, financial, equity, political, administrative and legal considerations. Each of these considerations will require criteria or tests by which to judge policy options. These criteria will seldom if ever have equal weight nor always be consistent.

We conclude that rational decisions about changes in irrigation fees or other methods of resource mobilisation cannot be made without simultaneously reviewing the broader context of the nation's sectoral price and taxation policies and its general macroeconomic policies and environment. For this reason it is not possible to give simple, universal answers to questions such as 'what is the best approach to financing the recurrent costs of irrigation?' Rather, a framework of analysis must be developed, which can then be applied flexibly to individual situations. This is the challenge that we undertake in this book.

1.2.2 *Conceptual framework to analyse irrigation financing policies*

Our analysis of irrigation financing policies is guided primarily by the conceptual framework provided by the discipline of economics. We are economists by training, and we find the concepts of economics provide a useful framework for identifying both problems and policy options for irrigation.

But we also believe that the concepts of economics are too valuable to be left in the hands of economists! We therefore develop the essential concepts in ways that should be readily understandable to non-economists. At the same time, students of economics may benefit from the opportunity to consider how the fundamental concepts adorning their economics textbooks can be brought to life amid the realities of critical policy concerns for irrigation in the Third World.

One of the advantages of economics as a framework for policy analysis

is that it provides two broad criteria, namely efficiency and equity, against which policies can be evaluated. Of the two, economics has tended to give greater emphasis to the efficiency criterion because it seems more 'objective' and therefore subject to more definitive conclusions. Equity, by contrast, is an inherently subjective concept, about which economists can seldom speak with authority. It is, however, a primary concern of those who call themselves 'political economists'.

In this book, we consider both efficiency and equity in evaluating irrigation financing policies. We identify four important efficiency criteria, each reflecting efficiency in the allocation or generation of one specific resource or set of resources. One general thesis underlying this book is that irrigation financing policies have the potential to affect, for better or for worse, the quality of performance of irrigation projects. The efficiency criteria that we use focus attention on the linkages between irrigation financing policies and irrigation performance.

But our book would be much too narrow if we limited our criteria to those derived from the concepts of economic efficiency. Irrigation financing policies involve decisions about who should pay how much for economic benefits provided to some as a result of public sector activities. Such decisions are inherently political in nature, and as such, they involve ideas (often conflicting ones) about equity. In the case of water, these conflicts often go deeper than with any other agricultural input with the possible exception of land. Fundamental attitudes about water often give the irrigation financing policy arena a highly charged emotional atmosphere. The importance of attitudes is well illustrated by the following quotation from a study on the Middle East:

> . . . the region's water resource quagmire is even deeper than technical, management, or economic constraints would suggest. More difficult to assess and alter are underlying passions. Although actual physical conditions vary from nation to nation, attitudes about water do not: in every country, access to clean water is considered an undeniable right, and tampering with water supplies is considered an unspeakable crime. Especially in more traditional agricultural areas, consumption patterns reflect deeply ingrained, age-old feelings about water. Water determines the nature of economic survival, permeates cultural norms, and infuses political ideology. Although technology may be harnessed, emotions pose the ultimate challenge.[3]

Equity questions can never be definitively answered by an external analyst. All that we can do is to identify equity as one of the criteria of

financing policies, draw attention to the kinds of considerations that are relevant to include in a policy evaluation, and where necessary, point out inconsistencies or other inadequacies in the political statements relative to the relationships between equity and irrigation financing.

In addition to looking to economics for the analytic concepts that allow us to evaluate irrigation in terms of efficiency and equity criteria, we also need to incorporate institutional considerations into our evaluation of irrigation financing policies. In any given situation, financing policies and the economic forces acting upon them operate within a specific institutional setting consisting of such things as organisations, rules and laws, and administrative procedures. A nation's institutional setting reflects a variety of its social, economic, political, historical and cultural characteristics. We identify one key element of this institutional framework – the presence or absence of financial autonomy – that is of particular importance to an understanding of the likely performance of irrigation financing policies. This institutional factor turns out to be of major importance in evaluating financing policies with respect to most of the efficiency criteria.

1.2.3 *Testing conclusions against field experience*

This is not an 'armchair economics' book. If we had nothing further to say on irrigation financing policies than could be derived from economic theory and concepts, we would not have bothered to write this book. Over the past several years, we have tested the concepts and methods we have developed in field studies in a variety of countries. We draw liberally from these field experiences to give flesh and details to the points we make in this book. This book is not an abstract modelling exercise. Our concern, rather, is to devise methods for obtaining finance and allocating scarce resources to irrigation. We are thus engaged in a practical exercise in political economy.

1.2.4 *Looking ahead: a brief summary of the main arguments*

The combined effects of the expansion of irrigation over the past few decades and the fiscal crisis faced by many governments during the 1980s have brought increased attention on the shortcomings of policies for financing the provision of irrigation services. Particular emphasis is placed on the ways of financing the recurrent expenditures for operation and maintenance of facilities already built.

In today's atmosphere of 'get the prices right', many argue that user fees for irrigation water should be established or raised. While we also have a preference for user fees (and devote much of this book to an examination of various details about the operation of such fees) our preference is contingent on existence of financial autonomy for the irrigation agency. Under financial autonomy, a system of user fees has the potential (1) to improve irrigation operations both by freeing the O&M budget from the constraints imposed by the central government's fiscal difficulties, and by increasing the accountability of the irrigation system managers to the water users; and (2) to encourage a more appropriate and realistic evaluation of irrigation investment proposals. These potential efficiency benefits are lost in the absence of financial autonomy.

Many advocates of user fees assume that the fees will encourage farmers to be more efficient in their use of water. But the validity of this argument is contingent on the fee being structured in such a way that the farmer's total water bill will vary according to his water-use decisions. In reality, most systems of user fees in Third World countries are not structured in this manner. Rather, the fee is fixed on some basis related to the area farmed.

The debate over irrigation fees is also argued on equity grounds. Poor farmers, it is often stated, should not be made even poorer by imposing a user fee on them. We agree that there are situations where the overall policy and macroeconomic framework is so distorted and skewed against the rural sector that imposing user fees for irrigation would be inappropriate. This is less an argument against user fees that it is an argument in favour of placing top priority on creating a more balanced policy and economic environment for the farming sector. But what about the more typical situations? A careful look at the equity question will often reveal that (1) irrigation farmers are certainly poor, but (2) rain-fed farmers, landless labourers and many urban people are even poorer. User fees may thus serve equity even though they require payments from poor farmers.

In general, we feel it is not desirable to attempt to use irrigation financing policies to pursue broad goals of social equity and income redistribution. This is not to deny the importance of these goals; rather, it reflects two conclusions that we have reached: (1) that irrigation financing policy is a relatively ineffective tool for achieving these social goals; and (2) that efforts to use irrigation financing policies to do so severely reduce their ability to perform their primary task of financing irrigation services.